Introduction

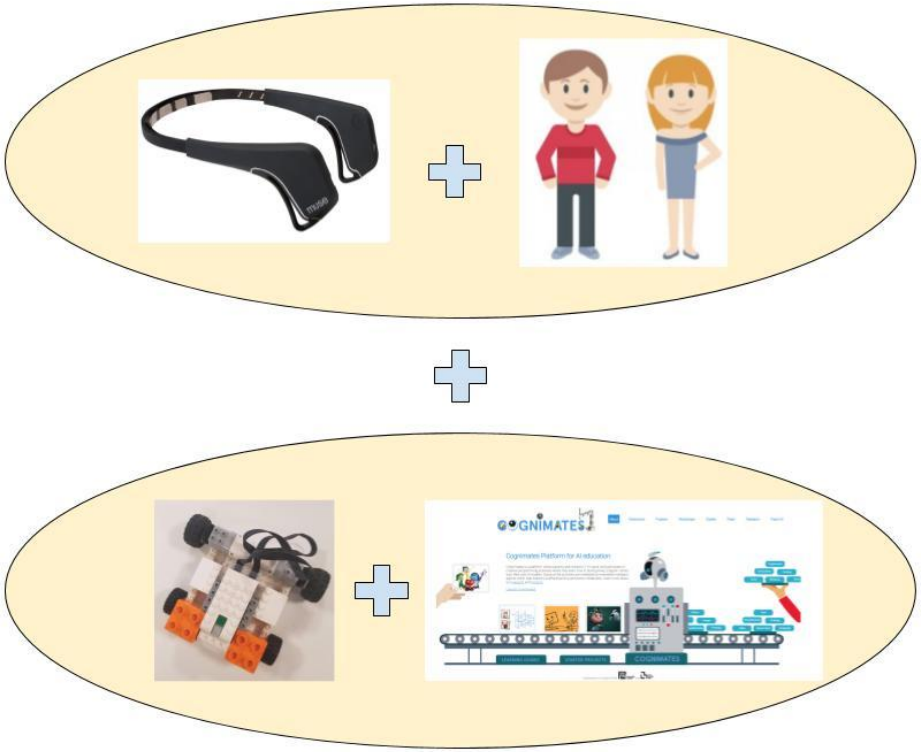
CIS Summer Camp

The Waterkinesis Project

Goal

- Use the Muse headsets to read brain movement
- Use the Lego WeDo to create a waterproof, moving device
- Control the Lego WeDo using EEG waves from the Muse headset
- Waterkinesis - control objects in water with your mind!

Big Idea



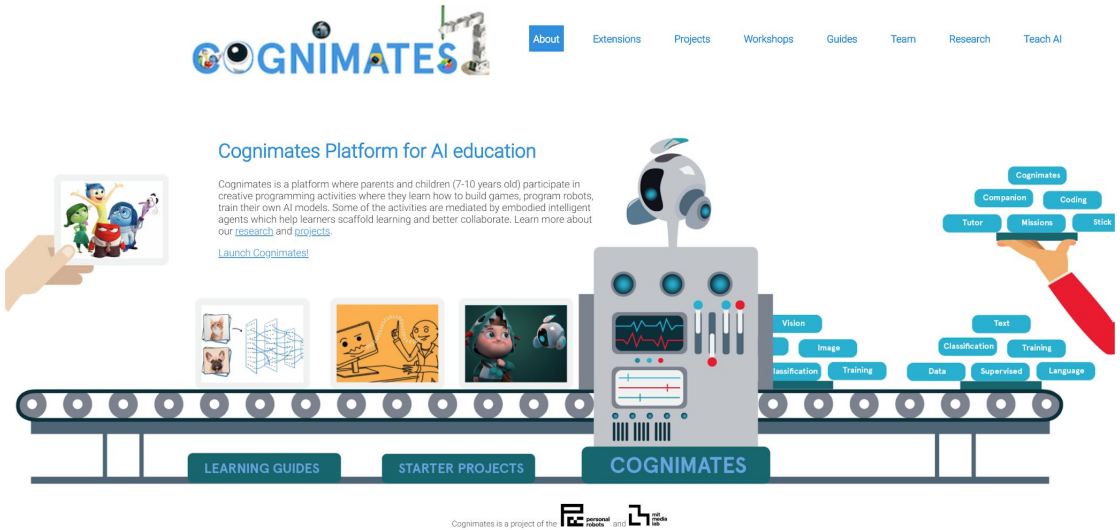
Muse headset record your data and send it over to Cognimates

Lego Wedo is programmed on Cognimates using the Muse data that was recorded, and the motor moves

Cognimates

What is Cognimates

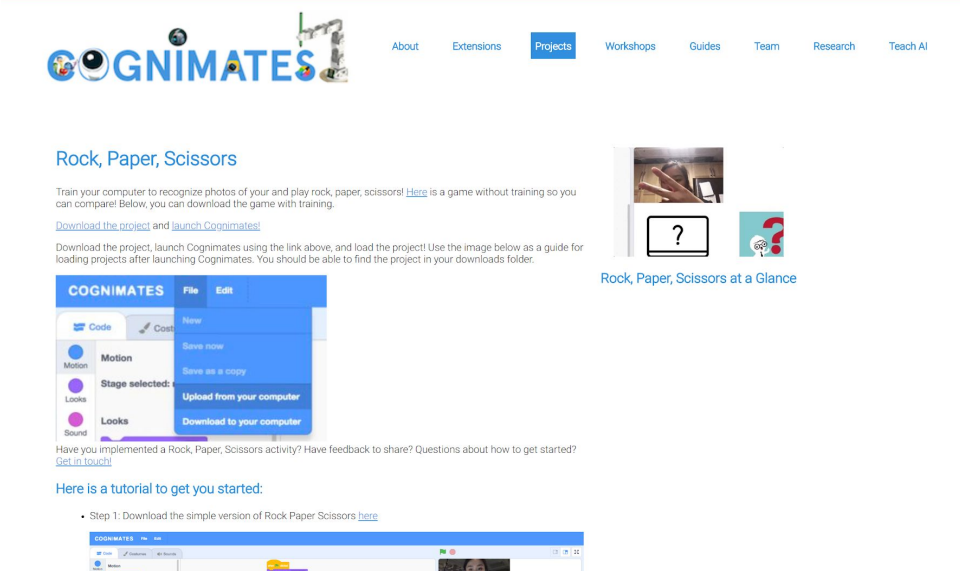
- Cognimates is a platform where you (and your parents!) can participate in creative programming activities
- Learn how to build games, program robots, or train your own Artificial Intelligence models (like text or speech recognition)



Website:
cognimates.me/

How to use Cognimates

- Go to the “projects” tab on the Cognimates website
- Pick a starter project, and follow the guided steps to get started!

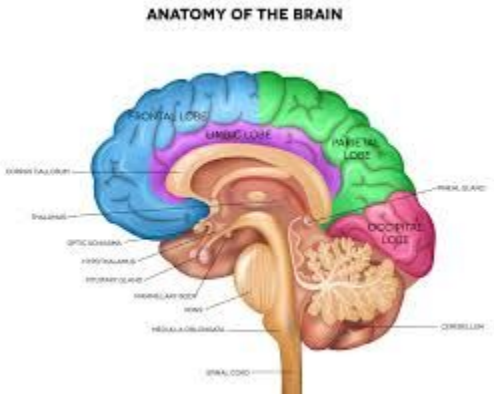


Example starter project where you train your computer to recognize photos of your hands and play rock, paper, scissors!

About EEG

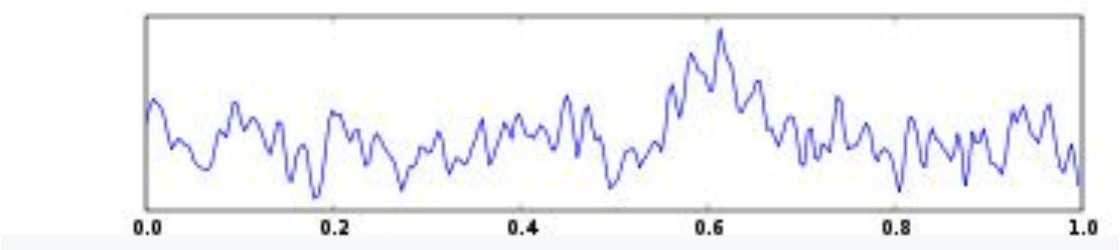
About the Brain

- Your brain is made up of billions of nerve cells, connected to each other in networks
- Every time you make a movement or have an emotional response, your brain also experiences lots of activity!
- The brain fires messages across networks to say things like “our human is now moving his left arm” or “our human is now blinking”



What is EEG?

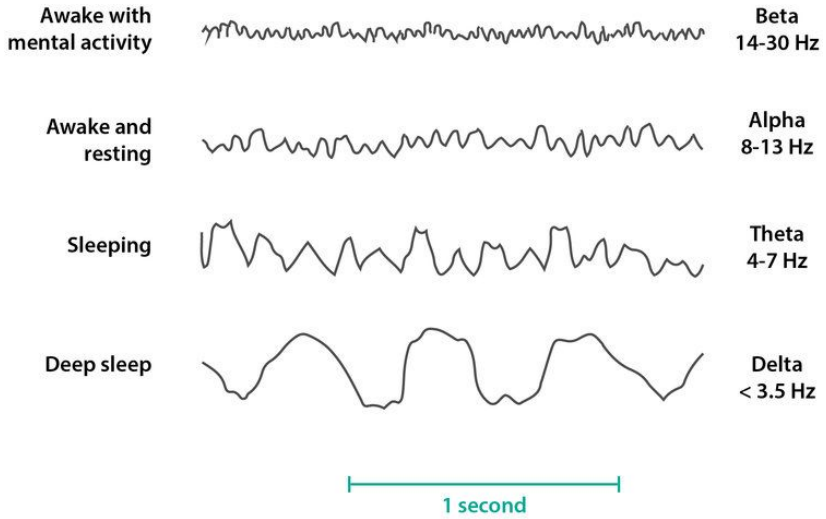
- EEG stands for **Electroencephalography**
- EEG is what we use to record brain activity in the form of graphs, just like you can record your heartbeat on a graph and see it on a heartbeat monitor



One second of EEG signal

Different types of EEG signals

- Your brain emits different types of waves depending on your state - whether you’re awake or asleep, relaxed or distressed
- Based on emotions and actions, the graphs will record different patterns and different types of waves



Different signals and graphs depending on different states

About Muse

What is Muse

- The Muse headband was made so that you can track your brain activity as you meditate
- Knowing what your brain activity looks like (steady or unsteady) can help you focus on relaxing rather than stressing
- The headband is an easy way for us to record our EEG data

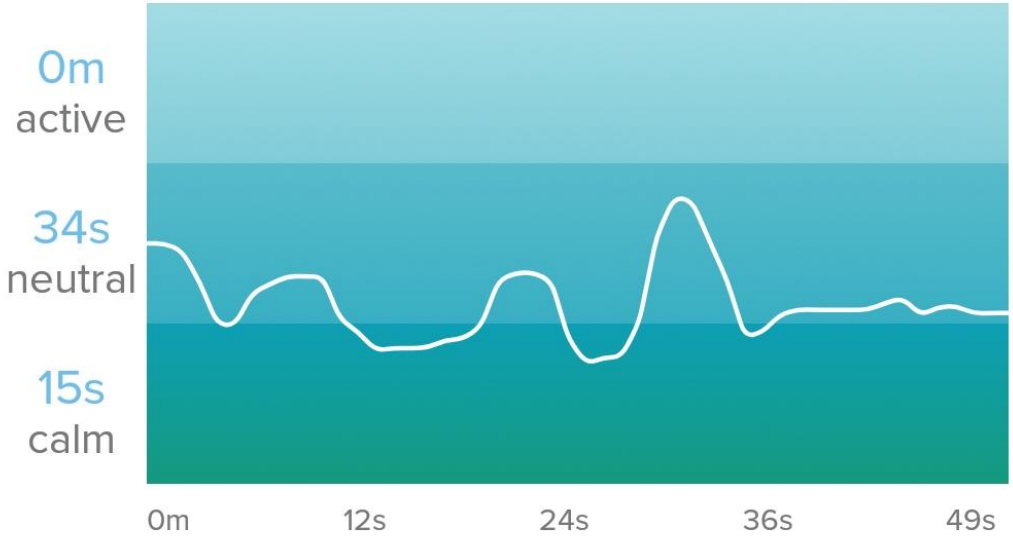
Muse headband structure

- The headband is used to detect and measure the activity of your brain, and it uses 7 finely calibrated sensors to do so.
- There’s 2 sensors on the forehead, 2 behind the ears, and 3 additional reference sensors in the middle of your forehead.

Muse headband diagram
(Credit: Muse website)

How it works

- The headband starts by calibrating, which means it records your brain waves for a few seconds when you're in a resting, calm state. This sets an example for what "relaxed" looks like in your brain. Then, it records you!



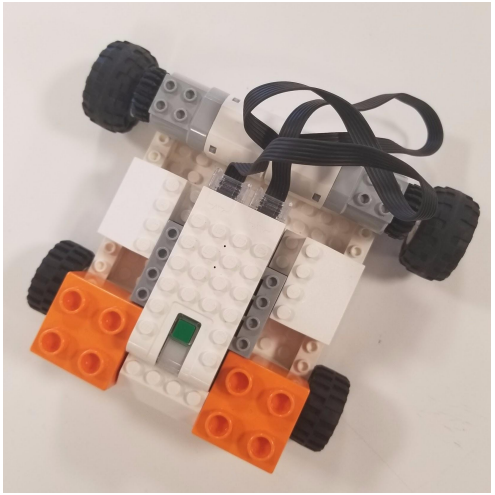
Example graph from 50 seconds on the Muse app

The first bump around 10s was right arm movement, the second bump around 20s was left arm movement, and the last big bump around 30s was a strong blink.

LEGO WeDo

What is a LEGO WeDo

- The LEGO WeDo is a hands-on STEM product created to combine the LEGO brick with classroom-friendly software
- Today, we will use the LEGO WeDo extension on Cognimates to get the motor to move based on Muse inputs



Getting Started

Online Questions

(add links)